AF

TRANSMITTAL OF APPEAL BRIEF (Large Entity)

Docket No. 29766-69245

In Re Application Of: **Carlton Bale et al.**

Application No.	Filing Date	Examiner	Customer No.	Group Art Unit	Confirmation No.
10/618,229	July 11, 2003	Carl Stuart Miller	30450	3747	4407

Invention: **SYSTEM FOR MODIFYING FUEL PRESSURE IN A HIGH-PRESSURE FUEL INJECTION SYSTEM FOR FUEL SYSTEM LEAKAGE TESTING**

COMMISSIONER FOR PATENTS:

Transmitted herewith ~~in triplicate~~ is the Appeal Brief in this application, with respect to the Notice of Appeal filed on **October 31, 2005**

The fee for filing this Appeal Brief is: **$500.00**

☐ A check in the amount of the fee is enclosed.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

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Jeff A Michael
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Dated: **February 28, 2006**

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29766-69245

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Art Unit:	3747
Confirmation No.:	4407
Application Ser. No.:	10/618,229
Title:	SYSTEM FOR MODIFYING FUEL PRESSURE IN A HIGH-PRESSURE FUEL INJECTION SYSTEM FOR FUEL SYSTEM LEAKAGE TESTING
Inventors:	Carlton Bale et al.
Filing Date:	July 11, 2003
Attorney Docket No.:	29766-69245
Examiner:	Miller, Carl S.

Certificate Under 37 CFR 1.8(a)

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on February 28, 2006

(Signature)

Jeffrey A. Michael

(Printed Name)

APPEAL BRIEF& PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)

Mail Stop: Appeal Brief - Patents
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P. O. Box 1450
Alexandria, VA 22313-1450

Sir:

This is an appeal to the Board of Patent Appeals and Interferences from the action of the Examiner finally rejecting claims 1-26 in the above-identified application. Provided herewith are the original and one copy of Appellants' brief on appeal in accordance with 37 CFR § 41.37. Appellants hereby request a two-month extension of time for extending the deadline for filing this Appeal Brief, and a check in the amount of $450 to cover the two month extension fee is enclosed. The Commissioner is authorized to charge $500 to cover the filing fee for this brief to

Deposit Account 10-0435. The commissioner is further authorized to charge any further fees which may be due, or credit any overpayments, to Deposit Account 10-0435, but not to include any payment of issue fees.

I. REAL PARTY IN INTEREST

The real party in interest in the above-identified application is Cummins, Inc., a corporation of the state of Indiana and having a business address of P.O. Box 3005, Columbus, Indiana 47202. Cummins, Inc. is the owner, by assignment, of the entire interest in the subject application, which assignment was recorded in the U.S. Patent and Trademark Office on Reel 014789, Frame 0019.

II. RELATED APPEALS AND INTERFERENCES

Appellants, appellants' legal representatives and appellants' assignee know of no other pending appeals or interferences which will directly affect, or be directly affected by, or have a bearing on, the Board's decision in the subject appeal.

III. STATUS OF CLAIMS

Original claims 1-7 and 9- 26, and amended claim 8, are subject to a Final Rejection from which this appeal was taken.

IV. STATUS OF AMENDMENTS

No amendments to the pending claims have been filed subsequent to the final rejection.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The subject matter of appellants' rejected independent claims 1 and 10 relates to a system for modifying fuel pressure in a high-pressure fuel injection system of an internal combustion engine. Appellants' independent claims 1 and 10 include the following claim elements:

a fuel collection unit configured to store high-pressure fuel therein;

at least one fuel injector configured to supply fuel from the fuel collection unit to the engine; and

"means for controlling" (claim 1) or "a control structure configured to control the" (claim 10) fuel pressure within the fuel collection unit to a target fuel pressure near a maximum allowable fuel collection unit fuel pressure level while maintaining low engine load.

In the embodiment illustrated in FIG. 1A, the fuel collection unit corresponds to the structure identified by the reference number (22), and is described as a conventional fuel accumulator or fuel storage unit (see page 5, lines 15-23 of appellants' specification). In the embodiment illustrated in FIG. 1B, in contrast, the fuel collection unit corresponds to the structure identified by the reference number (26), and is described as a fuel rail (see page 9, lines 1-12 of appellants' specification). In either case, high-pressure fuel is supplied to the fuel collection unit via a high-pressure fuel pump (18) (see page 5, lines 10-14 of appellants' specification).

In the embodiments illustrated in FIGS. 1A and 1B, the at least one fuel injector corresponds to at least one of the illustrated fuel injectors 24_1 - 24_N, where "N" may be any positive integer. The fuel collection unit (22 or 26') is fluidly collected to the at least one fuel injector 24_1 - 24_N, and the at least one fuel injector 24_1 - 24_N is configured to be mounted in fluid communication with a cylinder of the engine (12) (see page 5, lines 15-21 and page 9, lines 5-12, of appellants' specification).

In the embodiments illustrated in FIGS. 1A and 1B, the "means for controlling . . ." is illustrated as including a control computer (30) that is operable under normal operation to control the fuel pressure within the fuel collection unit (22, 26') to

achieve a desired pressure level therein. (see page 9, lines 13-19). It is desirable to check for fuel system and fuel system component leaks during low engine load conditions, but under such conditions the corresponding fuel pressure levels within the fuel collection unit (22 or 26') are generally lower than the maximum allowable fuel collection unit pressure. It is also desirable to maintain high fuel pressure levels within the high-pressure fuel injection system during such leak testing to make some leaks easier to detect and identify and/or to allow for the detection and identification of leaks that may occur or become apparent only at fuel system pressure levels above those typically attainable under low engine load conditions. The systems 10 (FIG. 1A) and 10' provide for the ability to override the normal fuel system operation and allow control of the fuel pressure within the fuel collection unit (22 or 26') to a target fuel pressure near the maximum allowable fuel collection unit pressure while maintaining low engine load (see page 9, line 19 - page 10, line 2 of appellants' specification). The phrase "near the maximum allowable fuel collection unit pressure level" is intended to define a band or window of fuel pressure values between a minimum fuel pressure that will allow for satisfactory identification of fuel leaks in the subsequent leak testing of the fuel system and the maximum allowable fuel collection unit pressure level, $FPCU_{MAX}$ (see page 16, lines 25-29 of appellants' specification).

Appellants' dependent claims 2-9 and 11-20 recite further structural limitations to claims 1 and 10 respectively, all of which are fully supported in appellants' specification.

The subject matter of appellants' rejected independent claim 21 relates to a method for modifying fuel pressure in a high-pressure fuel injection system of an internal combustion engine wherein the high-pressure fuel injection system includes

a fuel collection unit storing high-pressure fuel therein and at least one fuel injector supplying fuel from the fuel collection unit to the engine. These structures are described hereinabove with respect to claims 1 and 10. Appellants' independent claim 21 includes the following claim elements:

controlling engine load to within a range of low engine loads; and

controlling fuel pressure within the fuel collection unit to a target fuel pressure near a maximum allowable fuel collection unit pressure level while maintaining engine load within the range of engine loads.

In the exemplary embodiment illustrated in FIG. 2A, the control computer (30) is configured to control engine load to within a range of low engine loads by maintaining the vehicle carrying the engine in a stationary position (see page 10, lines 18-23 of appellants' specification). However, appellants' disclosure also clearly contemplates conducting leak testing while the vehicle is moving (see page 11, lines 23-25 of appellants' specification). In such cases, the control computer (30) may control engine load to within a range of low engine loads by controlling engine fueling to achieve an engine speed in a corresponding range of engine speeds (see step 114 of FIG. 2A and appellants specification at page 15, line 14 - page 16, line 17).

In the exemplary embodiment illustrated in FIG. 2A, the control computer (30) is configured to control fuel pressure within the fuel collection unit to a target fuel pressure near a maximum allowable fuel collection unit pressure level while maintaining engine load within the range of engine loads by adjusting the fuel pump command signal, FPC, to the high-pressure fuel pump 18 in a manner that achieves the target fuel pressure, FP_T, in the fuel collection unit 22 or 26' (see page 17, lines 1-4 of appellants' specification). The target fuel pressure, FP_T, is, in one

embodiment, set near the maximum allowable fuel collection unit fuel pressure level, $FPCU_{MAX}$ defined hereinabove (see page 16, lines 20-21).

Appellants' dependent claims 22-26 recite further method limitations to claim 21 respectively, all of which are fully supported in appellants' specification.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A. Whether U.S. Patent No. 3,938,377 to Converse III et al., in combination with U.S. Patent No. 6,712,045 to McCarthy, Jr., fails to render obvious appellants' claims 1-10 and 12-26, thereby failing to establish a prima facie case of obviousness of these claims under 35 U.S.C. § 103(a).

The claims on appeal are claims 1-26. A copy of all presently pending claims 1-26 is included in the claims appendix of section VIII.

VII. ARGUMENTS

A. Converse et al. in view of McCarthy, Jr. fail to render obvious appellants' claims 1-10 and 12-26.

Claims 1-10 and 12-26 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Converse III et al. ("Converse), U.S. Patent Number 3,938,377, in view of McCarthy, Jr. ("McCarthy), U.S. Patent Number 6,712,045. Claim 11 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Converse and McCarthy in view of Armstrong, U.S. Patent Number 5,461,908. It is appellants' position that the combination of Converse and McCarthy fail to render obvious each of appellants' independent claims 1, 10 and 21.

It is well settled that in order to establish *prima facie* obviousness of a claimed invention, all of the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981,1 80 USPQ 580 (CCPA 1974), MPEP § 2143.03. In this case, neither Converse nor McCarthy, alone or in combination, teach or suggest all

of the limitations of appellants' independent claims 1, 10 and 21.

Converse discloses a system for hot testing stationary automobile engines prior to installation in motor vehicles. The Converse system samples engine exhaust gas at various engine speed and load conditions, and then analyzes the sampled gases for their hydrocarbon (HC) and carbon monoxide (CO) levels. Nowhere does Converse describe, teach or suggest testing a high pressure fuel collection unit, or controlling fuel pressure within any such fuel collection unit.

The Examiner appears to cite the Converse reference for teaching the testing of stationary (e.g., prior to installation) engines under various load conditions, and attempts to read the "stationary vehicle" limitation into appellants' claims. In particular, the Examiner interprets appellants' claim term "low engine load" as requiring the vehicle to be stationary. However, as appellants have repeatedly argued, none of appellants' claims require the vehicle carrying the engine to be stationary, and it is impermissible to read such limitations into appellants' claims. Moreover, the Examiner's interpretation of appellants' specification is wholly inconsistent with the clear language recited in appellants' specification. For example, as summarized hereinabove, appellants' specification clearly contemplates conducting leak testing with the vehicle moving (see p. 11, lines 21-25, of appellants' specification). Accordingly, appellants' claim term "low engine load" cannot be read to require the vehicle carrying the engine to be stationary.

McCarthy describes a fuel control system configured to estimate fuel leakage in the form of a spilled fuel amount, to then determine a quantity of fuel pumped based on the spilled fuel amount and on an injected fuel amount, and then to control fuel rail pressure based on the quantity of fuel pumped. However, nowhere does McCarthy mention controlling the fuel rail pressure to a maximum allowable fuel rail

pressure while maintaining low engine load, as required by appellants' claims. The Examiner states in the Final Rejection that the *McCarthy* system "checks for leaks in various engine speed ranges and includes means for setting target speeds and target pressures . . . [h]igh pressures are used for higher loads and it would have been obvious not to exceed the maximum pressure of the rail (216) since this would always result [in] system failure." However, appellants' claims do not recite high pressures used at "higher loads." To the contrary, appellants' claims require controlling the fuel rail pressure to a maximum allowable fuel rail pressure while maintaining low engine load, and this feature is neither taught nor suggested by McCarthy.

In the Advisory Action after appellants' Request for Reconsideration, the Examiner raises for the first time the argument that appellants have "not claimed the maximum fuel pressure requirement in a way that would distinguish it from some pressure which might be used under normal running conditions." Appellants disagree. Each of appellants' independent claims 1, 10 and 21 clearly require, in some form, controlling fuel pressure within the fuel collection unit to a target fuel pressure near a maximum allowable fuel collection unit pressure level while maintaining low engine load, or, as in the case of claim 21, while maintaining engine load within a range of low engine loads. Moreover, appellants' specification clearly sets forth that the phrase "near the maximum allowable fuel collection unit pressure level" is intended to define a band or window of fuel pressure values between a minimum fuel pressure that will allow for satisfactory identification of fuel leaks in the subsequent leak testing of the fuel system and the maximum allowable fuel collection unit pressure level, $FPCU_{MAX}$ (see page 16, lines 25-29 of appellants' specification), and that such fuel collection unit pressure levels are typically not

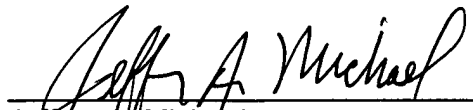
attainable under low engine load conditions (see page 9, lines 22-28). The "target fuel pressure near a maximum allowable fuel collection unit pressure level" is therefore clearly distinguishable from any fuel collection unit pressure level that might be used under normal running conditions as the Examiner contends. In any case, it is also clear that neither Converse nor McCarthy, alone or in combination, teach or suggest this feature.

As such, the § 103(a) rejection of claims 1, 10 and 21 is improper. Because claims 1-9, 11-10 and 22-26 depend from claims 1, 10 and 21 respectively, the § 103(a) rejection thereof is likewise improper.

CONCLUSION

Appellants respectfully submit that the Examiner has not established a *prima facie* obviousness of appellants' claims 1-26, and has therefore erred in rejecting claims 1-26. In view of the foregoing arguments presented, it is believed that each of claims 1-26 in the subject application is in condition for allowance. It is hereby requested that the Board reverse the Final Rejection of claims 1-26 and direct that this application be passed to issuance.

Respectfully submitted,



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VII. CLAIMS APPENDIX

1. (Original) System for modifying fuel pressure in a high-pressure fuel injection system of an internal combustion engine, the system for modifying fuel pressure comprising:

a fuel collection unit configured to store high-pressure fuel therein;

at least one fuel injector configured to supply fuel from the fuel collection unit to the engine; and

means for controlling fuel pressure within the fuel collection unit to a target fuel pressure near a maximum allowable fuel collection unit fuel pressure level while maintaining low engine load.

2. (Original) The system of claim 1 further including a vehicle speed sensor producing a vehicle speed signal indicative of road speed of a vehicle carrying said engine;

and wherein the means for controlling fuel pressure further includes means for controlling fuel pressure within the fuel collection unit to the target fuel pressure while maintaining low engine load only while the vehicle speed signal indicates that the vehicle is not moving.

3. (Original) The system of claim 1 further including an engine speed sensor producing an engine speed signal indicative of the rotational speed of the engine;

and wherein the means for controlling fuel pressure further includes means for controlling fuel pressure within the fuel collection unit to the target fuel pressure while maintaining low engine load only while the engine speed signal indicates that the rotational speed of the engine is within a predefined range of engine speeds.

4. (Original) The system of claim 1 further including a pressure sensor producing a pressure signal indicative of fuel pressure within the fuel collection unit;

and wherein the means for controlling fuel pressure further includes means for controlling fuel pressure within the fuel collection unit to the target fuel pressure while maintaining low engine load only while the pressure signal indicates that the fuel pressure within the fuel collection unit is below a fuel pressure limit.

5. (Original) The system of claim 1 further including further including:

a vehicle speed sensor producing a vehicle speed signal indicative of road speed of a vehicle carrying said engine;

an engine speed sensor producing an engine speed signal indicative of the rotational speed of the engine; and

a pressure sensor producing a pressure signal indicative of fuel pressure within the fuel collection unit;

and wherein the means for controlling fuel pressure further includes means for controlling fuel pressure within the fuel collection unit to the target fuel pressure while maintaining low engine load only while the vehicle speed signal indicates that the vehicle is not moving, the engine speed signal indicates that the rotational speed of the engine is within a predefined range of engine speeds and the pressure signal indicates that the fuel pressure within the fuel collection unit is below a fuel pressure limit.

6. (Original) The system of claim 1 further including a high-pressure fuel pump responsive to a fuel pump control signal to supply high-pressure fuel from a low-pressure fuel source to the fuel collection unit;

and wherein the means for controlling fuel pressure further includes means for modifying the fuel pump control signal to control the fuel pressure within the fuel collection unit to the target fuel pressure.

7. (Original) The system of claim 1 wherein the means for controlling fuel pressure includes means for controlling fuel pressure within the fuel collection unit to a target fuel pressure near a maximum allowable fuel collection unit fuel pressure level while maintaining low engine load and while controlling rotational speed of the engine to a target engine speed value.

8. (Previously presented) The system of claim 7 wherein the at least one fuel injector is responsive to a fueling command signal produced by the means for controlling fueling pressure to supply fuel from the fuel collection unit to the engine;

and wherein the means for controlling fuel pressure within the fuel collection unit to a target fuel pressure near a maximum allowable fuel collection unit fuel pressure level while maintaining low engine load and while controlling rotational speed of the engine to a target engine speed value includes means for modifying the fueling command signal to control the rotational speed of the engine to the target engine speed value.

9. (Original) The system of claim 1 wherein the means for controlling fuel pressure further includes means for maintaining low engine load by maintaining a vehicle carrying the engine in a stationary position.

10. (Original) System for modifying fuel pressure in a high-pressure fuel injection system of an internal combustion engine, the system for modifying fuel pressure comprising:

a fuel collection unit configured to store high-pressure fuel therein;

a fuel injector configured to supply fuel from the fuel collection unit to the engine;

a control structure configured to control the fuel pressure within the fuel collection unit to a target fuel pressure near a maximum allowable fuel collection unit fuel pressure level while maintaining low engine load.

11. (Original) The system of claim 10 wherein the control structure includes:

a control computer configured to control fuel pressure within the fuel collection unit and to control engine fueling; and

an auxiliary computer connected in electronic communication with the control computer, the auxiliary computer configured to direct the control computer to control the fuel pressure within the fuel collection unit to the target fuel pressure while maintaining low engine load.

12. (Original) The system of claim of claim 10 wherein the control structure includes a control computer configured to control fuel pressure within the fuel collection unit and to control engine fueling, the control computer further configured

to control the fuel pressure within the fuel collection unit to the target fuel pressure while maintaining low engine load.

13. (Original) The system of claim 10 wherein the control structure is configured to maintain low engine load by maintaining a vehicle carrying the engine in a stationary position.

14. (Original) The system of claim 10 further including a vehicle speed sensor producing a vehicle speed signal indicative of road speed of a vehicle carrying said engine;

and wherein the control structure is configured to control the fuel pressure within the fuel collection unit to the target fuel pressure while maintaining low engine load only while the vehicle speed signal indicates that the vehicle is not moving.

15. (Original) The system of claim 10 further including an engine speed sensor producing an engine speed signal indicative of the rotational speed of the engine;

and wherein the control structure is configured to control the fuel pressure within the fuel collection unit to the target fuel pressure while maintaining low engine load only while the engine speed signal indicates that the rotational speed of the engine is within a predefined range of engine speeds.

16. (Original) The system of claim 10 further including a pressure sensor producing a pressure signal indicative of fuel pressure within the fuel collection unit;

and wherein the control structure is configured to control the fuel pressure within the fuel collection unit to the target fuel pressure while maintaining low engine load only while the pressure signal indicates that the fuel pressure within the fuel collection unit is below a fuel pressure limit.

17. (Original) The system of claim 10 further including further including:

a vehicle speed sensor producing a vehicle speed signal indicative of road speed of a vehicle carrying said engine;

an engine speed sensor producing an engine speed signal indicative of the rotational speed of the engine; and

a pressure sensor producing a pressure signal indicative of fuel pressure within the fuel collection unit;

and wherein the control structure is configured to control the fuel pressure within the fuel collection unit to the target fuel pressure while maintaining low engine load only while the vehicle speed signal indicates that the vehicle is not moving, the engine speed signal indicates that the rotational speed of the engine is within a predefined range of engine speeds and the pressure signal indicates that the fuel pressure within the fuel collection unit is below a fuel pressure limit.

18. (Original) The system of claim 10 further including a high-pressure fuel pump responsive to a fuel pump control signal produced by the control computer to supply high-pressure fuel from a low-pressure fuel source to the fuel collection unit;

and wherein the control structure is configured to modify the fuel pump control signal to control the fuel pressure within the fuel collection unit to the target fuel pressure.

19. (Original) The system of claim 10 wherein the control structure is configured to control the fuel pressure within the fuel collection unit to a target fuel pressure near a maximum allowable fuel collection unit fuel pressure level while maintaining low engine load and while also controlling engine speed to a target engine speed.

20. (Original) The system of claim 19 wherein the at least one fuel injector is responsive to a fueling command signal produced by the control computer to supply fuel from the fuel collection unit to the engine;

and wherein the control structure is configured to modify the fueling command signal to control engine speed to the target engine speed.

21. (Original) A method for modifying fuel pressure in a high-pressure fuel injection system of an internal combustion engine, the high-pressure fuel injection system including a fuel collection unit storing high-pressure fuel therein and at least one fuel injector supplying fuel from the fuel collection unit to the engine, the method comprising:

controlling engine load to within a range of low engine loads; and

controlling fuel pressure within the fuel collection unit to a target fuel pressure near a maximum allowable fuel collection unit fuel pressure level while maintaining engine load within the range of low engine loads.

22. (Original) The method of claim 21 further including controlling engine speed to within a range of engine speeds prior to controlling fuel pressure to the target fuel pressure.

23. (Original) The method of claim 21 wherein the act of controlling engine load to within a range of low engine loads includes maintaining a vehicle carrying the engine in a stationary position.

24. (Original) The method of claim 21 further including continually executing the act of controlling fuel pressure within the fuel collection unit only while a vehicle carrying the engine is not moving.

25. (Original) The method of claim 21 further including continually executing the act of controlling fuel pressure within the fuel collection unit only while engine rotational speed is within a predefined range of engine speeds.

26. (Original) The method of claim 21 further including continually executing the act of controlling fuel pressure within the fuel collection unit only while the fuel pressure within the fuel collection unit is below a fuel pressure limit.